VI.

ON WATER SUPPLY TO THE CITY OF MELBOURNE.

BY M. B. JACKSON, C.E.

READ DECEMBER 23, 1854.

The extraordinary and almost unprecedented rapidity of the growth and extension of the city of Melbourne, which, within a period of about twenty years from its foundation, has attained a population of nearly 100,000, coupled with the fact, that the entire supply of fresh water to the inhabitants has, until lately, been derived either from the winter rains or drawn from the river to the houses of the inhabitants, at an almost fabulous expense, in water carts, may create some surprise in the minds of reflecting individuals that steps have not been taken until a recent period to provide a permanent and sufficient supply to the city, on the constant and high service principle.

The first document extant, which shows that the subject had engaged the attention of any public body, is a report of the late City Surveyor, James Blackburn, Esq., to a Committee of the City Council, dated January 8th, 1851. This report, along with several others, were submitted by that gentleman to the City Council, and in the whole of them the writer evinced a considerable amount of practical knowledge of the subject on which he treated. Previous to this date, however, it appears from the City Surveyor's report a suggestion had been made by Mr. King, formerly Town Clerk

of Melbourne, that a supply for the city might be obtained by erecting water-wheels near Dight's mill, and constructing reservoirs on the high ground, near the residence of John Hodgson, Esq., M.L.C.

Towards the close of the year 1852 a Select Committee of the Legislative Council was appointed, to inquire into the subject, and to consider and report on the various schemes that had up to that time been proposed for supplying the city.

These schemes appear to have been five in number. 1st. That of Mr. King, which consisted in driving a tunnel through the isthmus, near Dight's mill, so as to render available a fall of the river, of from twelve to thirteen feet, for the purpose of driving one or two water-wheels.

2nd. That of Mr. Blackburn, which proposed to draw the supply of water from several creeks and springs which flow from Mount Disappointment, and which when united form the River Plenty.

3rd. Mr. King's scheme, as modified by Mr. Blackburn—the modification consisting in a suggestion to erect a steam-engine, as an auxiliary to the water-wheels.

4th. Mr. Hodgkinson's scheme, which was to raise the entire supply by steam-power into reservoirs, situated on the high ground near Dight's mill, on the south side of the river, the reservoir to be situated about 1,500 feet from the proposed engines.

5th. Mr. Blackburn's gravitation scheme, as modified by Mr. Oldham—the modification consisting chiefly in recommending that pipes should be substituted for an open cut, as the means of conveying the water from the Plenty to Melbourne.

The result of the deliberations of the Select Committee was, that a Commission, consisting of four gentlemen, (non professional,) was appointed, to enter into the subject closely, and afterwards to cause to be carried out that scheme, "not

limiting the choice to those already proposed," which should, after due deliberation, appear to them to be the best.

On the 20th of June, 1853, I had the honor of being appointed Engineer to this Commission, and I received directions to examine and report on the different schemes that had then been proposed for supplying the city from the Yarra.

The first of these schemes, that of Mr. King, I condemned at once, inasmuch as I found that the fall was insufficient; that the whole quantity of water passing down the river in a season of great drought would not be enough to work wheels of the power required; and that they would be inoperative during floods, the water having been known to rise upwards of twenty feet. A suggestion made by the late James Blackburn, Esq., to erect a steam-engine as an auxiliary, I also deemed it inexpedient to adopt.

The next scheme to which my notice was directed was one known as Mr. Hodgkinson's, which was to erect two steam-engines on the banks of the Yarra, opposite the Yarra Bend Lunatic Asylum, and to construct reservoirs on the high ground, in the rear of the residence of John Hodgson, Esq., M.L.C.

To this scheme also I considered that there were many weighty objections, the chief of which were the great difficulty, "not to say impossibility, of conveying to the proposed site for the engines the machinery required," the enormous cost of constructing the reservoirs which would have required to be excavated out of a bed of bastard freestone, not calculated to hold water, and the great expense of executing repairs and providing fuel.

These were the schemes that had been proposed for supplying the city from the Yarra; and, although I was well aware that it was quite possible to devise a pumping scheme, in which most of the difficulties above stated would have been obviated, I considered it my duty to recommend that

the country round Melbourne should be well and thoroughly explored, to ascertain all the facilities that existed for supplying the city by gravitation.

Having thus come to the conclusion that the natural method of gravitation was the only plan to be pursued, I turned my attention to the river Yarra, to ascertain if it were not practicable to derive a supply from it; but so precipitous are its banks that I found it impossible to dam it back or lead in a pipe in a shorter distance than upwards of thirty-five miles from Melbourne.

I next examined the Diamond, Darebin, and Merri Creeks, (vide plan,) and the Plenty River and I found that the Merri Creek took its rise from a large swamp, covering about 1,200 acres of ground: that this swamp received the drainage of above thirty square miles, and that the water was discharged from the swamp into the Creek by a narrow outlet. This I considered a very eligible site for the construction of a store reservoir, as a very short embankment would convert the swamp into a large artificial lake; but on measuring the distance from town I ascertained that it exceeded thirty miles.

It is an indisputable fact, however, that the converting of this swamp, "and also many others," into large store reservoirs, to be used to irrigate the country during the dry weather, would be a great public benefit; that by these means the country might be converted into a great grain-producing district, exceeded by none in the world; and that until such measures are adopted it will be comparatively sterile.

I am also of opinion that such artificial lakes would have a great and beneficial effect on the hot winds of the colony, and undoubtedly bush fires would no longer occur in the districts commanded by such reservoirs.

Having thoroughly explored the country for a distance of thirty miles round Melbourne, and ascertained that neither

the Diamond nor Darebin Creeks presented greater facilities than the Merri, I examined the Plenty River, and found that the scheme suggested by the late James Blackburn, Esq., was, with some modifications, the best that could be devised. This plan was to convert into a large store reservoir a swamp known as Rider's Swamp, situated on the east bank of the Plenty, and about twenty miles from town, and to lead the water by an open aqueduct into two distributing reservoirs, to be constructed near the Cemetery.

The necessity of constructing a store reservoir would not be manifest to a casual observer; but as it would appear from the evidence of those settlers who have been established on the banks of the River Plenty for the longest period of time, that at a ford known as the Bridge Inn Ford, the Plenty has been known, on several occasions, to cease to flow, the necessity becomes more obvious. I therefore adopted the site proposed by Mr. Blackburn for a store reservoir; which, for its natural fitness for the construction of a reservoir is not to be surpassed; and proceeded to mature the plan for supplying the city.

In the first place, I found that the store reservoir would receive the drainage of upwards of nine square miles.* By the first plan made under my direction for supplying the reservoir, the drainage into the reservoir, independent of the River Plenty, would have been upwards of eighteen square miles† —an area which, in my belief, is sufficient of itself to afford an ample supply of water for the city, without looking to any other source; but as droughts of two or three years standing have been known to occur, I considered that it would be advisable to lead in the Plenty River.

Mr. Blackburn originally proposed to lead in the river, over the end of the embankment. In my plans the river is

* The real drainage area of the reservoir basin is 5950 acres, including the area of the reservoir itself.

† This plan was afterwards altered, and a cheaper substituted.

caused to enter at the west side of the reservoir, and to pass out over a bye-wash at the south end.

By these means circulation will be promoted through the reservoir. To lead the water into the reservoir, however, it is necessary to drive a drift, 420 yards in length, through the saddle of the range.

Into the valley of the Plenty, it is perhaps necessary to remark, that the water from the Merri Creek, the King Parrot Creek, one of the tributaries of the Goulburn river, and the Running Creek, could be led; and thus a supply for almost any amount of population could be obtained.

In passing from the store reservoir, the surface of the water in which will be 595 feet above the sea, the water for the supply of the city will be discharged through three pipes, passing through the embankment; and immediately within the embankment a tower well, with discharging valves, &c., has been erected.

The method adopted for discharging the water through the well, with the valves, &c., I believe to be entirely original, and one which has never before been adopted.

From the outside of the embankment one line only of the pipes is at present intended to be laid—this line will be led down to a point distant about seven miles from Melbourne, and at a level approaching 300 feet above the lowest part of Melbourne, and 150 feet above the highest; a distributing reservoir with filters, &c., is intended to be constructed. From this distributing reservoir I propose to lay down one pipe for the present supply of the city; but, at any time by laying down a second line of pipes to the distributing reservoir an additional supply can be obtained, and should it ever be required, a second or even a third line can be laid from the store to the distributing reservoir.

Many objections have at different times been raised to the scheme of supplying the city from the Plenty; and, it has been stated that the supply of water will be insufficient.

No objection has, however, ever been raised by any practical man, and I purpose, at no distant date in another paper, to endeavour to show to the members of this society, that the whole of the objections that have been raised have been made by parties who have either wilfully misrepresented facts; or, have been incompetent to distinguish between reliable evidence and the contrary; and I would here venture to remark, that the knowledge which is acquired by practical men during many years' experience has been hitherto too much neglected on engineering works in the Australian Colonies. I am, myself, of opinion that the supply which can be obtained from the Yan Yean Reservoir will be amply sufficient, not only for Melbourne, but for Collingwood, Richmond, Prahran, St. Kilda, Brighton, Williamstown, &c.; and I am persuaded that it is at once the cheapest and most effectual scheme that could have been devised.

The advantages to be derived from the Plenty scheme are also not directly confined to merely supplying water to the inhabitants for sanitary purposes, although that object is of primary importance—the water pressure may be rendered available for working hydraulic engines throughout the city, as well as hydraulic cranes along the wharf; the irrigation of a district of considerable extent may also be considered as an advantage of no mean importance, not only to that tract of country through which the line of pipes will pass, but to the colony generally. I still retain the opinion which I have many times expressed, that great and comprehensive schemes for irrigating many tracts of country, which are now comparatively sterile, will at no very distant date be favourably entertained by the public.

I would conclude this paper by remarking, that even supposing that the loss of water from the Yan Yean Reservoir by evaporation and absorption were thrice the registered loss, in a somewhat analogous case, *i. e.* Glasgow, it would be under four feet, and I have not the least hesitation in stating, from

my own experiments, that the statement that the loss by evaporation only would be nine feet, is entirely erroneous. I propose, however, to enter on this subject more fully in a future paper.

VII.

OBSERVATIONS ON THE PROPOSED LOAN FOR PUBLIC WORKS IN VICTORIA.

BY EDWARD GRAVES MAYNE, ESQ.,

BARRISTER-AT-LAW.

It is not my intention to discuss in this paper the general question of the expediency of a public loan for Victoria. I assume it as settled, that such a loan is to be raised, from English or foreign capitalists, for expenditure on reproductive works in this colony; and I propose merely to consider, whether it is likely to realize all the benefits which are ordinarily anticipated from it, and how far its doing so will depend on its being combined with other auxiliary measures.

A sum applied to the construction of public works must be expended on the three elements of materials, implements, and labour. No matter what intermediate processes it may pass through, it must eventually, so far as it effects its pur-